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OVEREDUCATION IN THE AUSTRALIAN LABOUR MARKET: ITS INCIDENCE AND EFFECTS

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Overeducation is a form of labour underutilisation which occurs when the formal education level of a worker exceeds that which is required for the job. It is a form of underemployment that imposes significant costs on individuals and economies. Using data from the Negotiating the Life Course survey this study determines the incidence and effects of overeducation in the Australian labour market. This study found that 27.1 per cent of individuals are overeducated, and the incidence is higher among those who are young, have preschool-aged children, work in large firms and have fewer years of tenure. A positive relationship was also found between time-related and skill-related underemployment. Overeducation is found to impose costs on individuals, reducing earnings by between 10 and 20 per cent and lowering job satisfaction.

Keywords: Overeducation, labour market, education, earnings

JEL Codes: I21, J23, J24, J31

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I. Introduction

Skill-related underemployment occurs when workers possess skills that are not fully utilised in their jobs. As actual skills possessed by workers are difficult to quantify, human capital, which is comprised of formal education, experience and training, is used as an imperfect proxy for skills. Skill-related underemployment is closely related to overeducation, which arises when the formal education level of workers exceeds that which is required for their jobs. Overeducation is a form of labour market mismatch that has economic costs. It represents an inefficient allocation of human capital resources such that it reduces allocative efficiency, productivity and economic growth. Overeducation also means that there is an excess supply of educated labour. This implies that the level of individual and public investment in education is inconsistent with the social optimum. Finally, overeducation imposes costs on individuals, in terms of lower returns to human capital investment, reduced job satisfaction, and inferior promotion prospects.[1]

The potential economic costs of overeducation and the associated skill-related underemployment mean that it is important to understand the nature and extent of these problems. This study uses data from the 1997 Negotiating the Life Course survey to firstly estimate the incidence of overeducation in Australia by comparing the skill requirements jobs with the actual education attainment of workers. Secondly, the effect of individual and job characteristics on the incidence of over and undereducation is estimated. Finally, the effects of overeducation on earnings and job satisfaction are evaluated in order to assess the economic costs of labour market mismatch. This study contributes to the existing literature on overeducation firstly by determining whether the findings from overseas hold for the Australian labour market, and secondly by assessing whether a relationship exists between skill-related and time-related underemployment.

This paper is organised as follows. Section II provides an overview of the main theoretical perspectives on overeducation. In Section III, the data and measurement techniques are described, and descriptive statistics presented. Section IV tests for the individual and job characteristics that influence the incidence of overeducation. The

[1] Some researchers have questioned the concept of overeducation, arguing that increased educational attainment leads to an upskilling of jobs rather than an underutilisation of skills, which increases productivity (Borghans and de Grip 2000).

effects of overeducation on individual outcomes are evaluated in Section V, and Section VI concludes.

II. Theoretical perspectives

Overeducation is said to occur when the education level of a worker exceeds the amount that is required to obtain or perform the job. To the extent that education is correlated with skills, overeducation implies an underutilisation of skills. Research into overeducation commonly finds that workers in jobs for which their actual education level exceeds the required level earn more than workers in the same position who possess the required level of schooling, and less than workers with the same education in jobs that require that level. A number of conventional labour market theories have been employed to explain the existence of overeducation and account for its effect on earnings. This section reviews the main theoretical perspectives on overeducation to establish a framework for the empirical analysis.

Under the human capital model, overeducation arises when there is an increase in the educational attainment of workers which causes the relative wage of high-skilled workers to fall. Producers, faced with a cheaper supply of educated labour, substitute away from low-skilled workers towards the more highly skilled. Educated workers are placed in positions previously filled by low-skilled workers. On the supply side, lower returns to education induce individuals to reduce their investment in human capital. The human capital model predicts that overeducation and the associated economic costs are temporary, as firms adjust their production processes and workers reduce their investment in education in response to lower returns.

Career mobility theory extends human capital theory by analyzing total human capital. In this model, education, experience and training are assumed to be substitutes, and each of these components of human capital are positively related to productivity and earnings. Career mobility theory suggests that new entrants to the labour market with high levels of formal education accept positions for which they are apparently overeducated whilst they gain experience and occupation-specific human capital through training. Overeducation is a temporary phenomenon for individuals, who progress from being in positions for which they are overeducated to higher level occupations in which they make full use of their qualifications. This

implies that overeducation is a standard feature of a well functioning labour market, and is factored into decisions made by individuals and firms. Consequently, there are negligible economic costs associated with overeducation.

Job competition theory offers a demand side explanation. Central to the job competition theory is the assumption that workers compete in the labour market for high wage jobs. This creates a job queue in which jobs are ranked by earnings. On the demand side, competition between firms for high productivity workers creates a labour queue in which workers are ranked by their potential training costs. As formal education and on-the-job training are assumed to be complements, training costs are lower for those with more education. Hence workers are ranked by education level in the labour queue, and highly educated persons are matched to high paying jobs (Thurow 1975).

The job competition model assumes that productivity and earnings are related to job rather than worker characteristics. This implies earnings are driven by demand side factors alone. Overeducation arises when there is an increase in the educational attainment of workers. This causes a shift in the distribution of workers in the labour queue, forcing the low-skilled into low paid jobs or out of the labour market entirely. Consequently, overeducation leads to low-skilled workers being 'bumped down' into lower wage jobs or 'crowded out' of the labour market into unemployment. Overeducation also reduces the return to education as high-skilled individuals are forced to accept jobs lower in the job queue. Despite lower returns to educational investment, it is rational for individuals to invest in education as workers need to defend their position in the labour queue (Thurow 1975, p.96). The job competition model predicts that overeducation persists, and that it creates economic costs in the form of suboptimal investments in education, allocative inefficiencies, and increased income inequalities.

The assignment model is an alternative approach that employs matching theory to incorporate both demand and supply side factors (Sattinger 1993). In this model worker productivity is positively related to education, yet not all similarly educated workers are equally productive in all jobs. Indeed, workers have a comparative advantage in specific jobs. The problem of overeducation arises when workers are not allocated to jobs in which they have a comparative advantage. Overeducation is a

form of allocative inefficiency whereby skills are underutilised. This has a negative impact on productivity. Under the assignment model, overeducation persists until a more efficient allocation of individuals to jobs can arise, through improved matching processes or government policies to reduce inefficiencies.

The job-signalling model has also been applied to overeducation (Spence 1973). In this model, firms are assumed to have imperfect information about the productivity of workers. In response to this problem, individuals use education as a signal of quality. Overeducation arises when there is a signalling equilibrium under which it is optimal for individuals to invest in more education than is strictly required to perform the tasks of their jobs (Spence 1973, p.368).[2] This implies there is a systematic overinvestment in education, which occurs either when the costs of investing in education are low, or when the expectations of individuals or firms about education levels are inflated. Whilst overeducation can arise in a signalling equilibrium, it is a Pareto inferior equilibrium in which overeducation persists.[3]

The final approach applies spatial mobility theory to the labour market (Frank 1978; Büchel and van Ham 2003). Spatial mobility theory suggests that because workers are limited in their capacity to migrate or commute they search for jobs in local rather than global labour markets. However, in small local labour markets highly skilled workers face fewer suitable job opportunities. Faced with limited opportunities, individuals have three options – unemployment, accepting a job for which they are overeducated, or accepting a job in a different local market for which they are required to migrate or commute (Büchel and van Ham 2003, p.483). Individuals with extensive spatial constraints have a limited capacity to migrate or commute, and as a result, are more likely to be unemployed or to work in a job for which they are overeducated. Spatial constraints are greater for married women, particularly those with children, and for individuals without access to adequate transport options or who live long distances from urban labour markets. Spatial mobility theory predicts that the incidence of overeducation will be higher in small isolated labour markets and among those with limited spatial flexibility.

[2] A signalling equilibrium occurs when a firm's expectations about the signals displayed by potential employees are confirmed (Spence 1973, pp.360-361).
[3] Both the job competition and signaling models cannot explain undereducation, where workers have less education than is required for the job.

Consequently overeducation will create economic costs in the form of inequality in the geographical distribution of income, and reduced allocative efficiency.

III. Data and measurement

The previous section outlined the main theoretical perspectives on overeducation. This section describes the dataset, outlines the techniques used to measure overeducation and presents basic descriptive statistics.

i. Data

This study uses the Negotiating the Life Course (NLC) longitudinal panel survey of 18 to 54 year old persons living in Australia. The survey was based on a random sample, with data collected by telephone interview. This paper uses the 1997 wave of data, which contains 2231 unweighted cases. The response rate for the survey was 63 per cent.[4] Self-employed persons are excluded, which reduces the sample to 1930 observations. For each stage of the analysis, separate models are estimated for the male and female samples, which contain 802 and 1128 observations respectively.[5]

To incorporate spatial factors into the analysis, the Australian Standard of Geographical Classifications (ASGC) Remoteness Classification is used to transform postcode data into three variables describing the size of the respondent's local labour market. The ASGC uses the Accessibility/Remoteness Index of Australia to define five regions with varying degrees of access to goods and services: major city, inner regional, outer regional, remote and very remote.[6] Due to the small sample size, these were combined into three variables: major city, inner regional, and outer regional and remote.

ii. Measuring overeducation

Studies use one of three techniques to measure overeducation: job analysis (JA), realised matches (RM) or worker self-assessment (WA). JA takes assessments made by professional job analysts on the education and training requirements for different

[4] The response rate excludes interviewees that refused immediately, or when the interview was not possible.
[5] Econometric analysis is conducted using EViews 5. Note that the number of observations varies across specifications estimated due to missing values.
[6] Each postcode is assigned an ARIA index according to the average index of all households in that location. The ASGC categories are then applied. See ABS (2003a) for a detailed description of the ASGC index.

occupations, and compares these requirements to the actual educational attainment of workers. The RM technique derives the required education level from the mean or median of the observed distribution of actual educational attainment of workers in each occupation. Workers are overeducated (undereducated) if their educational attainment is more than one standard deviation above (below) the mean or median. WA measures overeducation by comparing the level of education workers *believe* they require to obtain or perform their job to their actual education level.

WA is thought to be the best measure available as it is up-to-date and specific to an individual's job. As a result it has been used extensively in recent studies (Duncan and Hoffman 1981; Sicherman 1991; Hersh 1991; Alba-Ramírez 1993; Robst 1995; Sloane *et al* 1996; Sloane *et al* 1999). Yet problems can arise in using this technique as individuals have a propensity to inflate reported educational requirements. This can lead to the incidence of overeducation being understated (Hartog 2000, p.132-133). However, by not accounting for differences in the quality and type of education, the WA measure can overstate the extent of overeducation.[7] Despite these caveats, this technique is thought to be most effective in measuring overeducation. Consequently, the WA technique is employed in this study.

The NLC survey asks respondents "about how much education or schooling is required to get a job like yours?" (Australian Social Sciences Data Archives [ASSDA] 2002, p.90). Four categories of educational attainment are listed: incomplete secondary school, complete secondary school, post-school certificate or diploma, and degree from a university. Respondents are also asked about the highest level of education attained. Results for highest education level are divided into five categories, which are the same as for required education except for the post-school certificate or diploma category which is divided into incomplete undergraduate or associate diploma, and vocational qualifications categories.[8] These two categories are combined in this study to enable comparison between the required and highest education variables.

Both the required and highest education variables contain only broad education categories. This places some limits on the analysis, and impedes identification of the

[7] The WA measure has also been criticised on the grounds of subjectivity bias, cognitive dissonance, and systematic bias in how job requirements are assessed across genders (Battu *et al* 2000).
[8] The highest education variable is imputed from Q52, Q54 and Q57 in the NLC survey (ASSDA 2002).

intensity of overeducation among individuals with postgraduate qualifications. Moreover, the education categories are unable to capture differences in actual and required education by field of study.[9] These limitations imply that measured overeducation may capture unobservable skill differentials and differences between field of study and sector of employment, in addition to differences between the levels of education attained and required (Chevalier 2003, p.509).

To construct the over and undereducation variables, the education requirements of respondents' jobs are compared with their highest education levels. Overeducated workers have an education level higher than that required to obtain the job, and undereducated workers have less education than is required. Table 1 shows the proportion of employed persons with a given highest education level in positions with a given required education level. The diagonal elements are correctly matched workers, whilst those above the diagonal are overeducated and those below are undereducated.

Table 1: Allocation of workers to jobs by highest education level, combined sample (%)

	Required education				
Highest education	*Degree*	*Diploma*	*Secondary*	*Incomplete secondary*	*Total by highest education*
Degree	78.72	9.12	6.69	5.47	100
Diploma	13.02	41.00	22.99	22.99	100
Secondary	11.30	14.64	39.33	34.73	100
Incomplete secondary	5.99	12.62	24.61	56.78	100
Total by required education	27.12	21.84	22.29	28.75	100

iii. Descriptive statistics

This section ascertains the incidence of overeducation in Australia and examines how the incidence varies across population subgroups. Descriptions of the variables used in the analysis are included in Appendix A, along with the summary statistics. Overall, 27.1 per cent of employed persons are classified as overeducated, whilst 19.2 per cent are undereducated.[10] The incidence of over and undereducation is comparable to that found in British and American studies employing the WA technique (see Table 2).

[9] Information on the field of study of the respondent's highest level of education was collected in the NLC survey, however due to the large number of missing observations this information was not used in the analysis.
[10] As the sample is confined to 18-54 year olds, the incidence of undereducation may suffer from a downward bias given that undereducation is likely to be increasing with age.

Table 2: Incidence of overeducation, findings from overseas

				Incidence (%)	
Study	**Year**	**Country**	**Measurement technique**	**Overeducation (male/female)**	**Undereducation (male/female)**
Alba-Ramírez (1993)	1985	Spain	WA	15.3/20.6	28.0/13.8
Battu and Sloane (2002)	1993-94	UK	RM	33.0	21.6
Büchel and Battu (2003)	1995	Germany	WA	30.3/39.3	
Büchel and van Ham (2003)	1998	Germany	WA	18.8	
Dolton and Vignoles (2000)	1980	UK	WA	38.0	15.0
	1986			30.0	11.0
Duncan and Hoffman (1981)	1976	USA	WA	42.0	11.9
Groot (1996)	1991	UK	RM	13.0/10.0	10.0/8.0
Halaby (1994)	1973/1977	USA	WA	30.0	
Hersh (1991)	1986	USA	WA	53.8/45.5	14.0/21.0
McGoldrick and Robst (1996)	1985	USA	RM	15.8/9.3	
			WA	30.1/31.5	
Robst (1995)	1976/1978	USA	WA	35.8	20.0
	1977	USA	JA	11.0-17.0	
Rumberger (1981)			WA	16.0	
Sicherman (1991)	1976/1978	USA	WA	40.8	16.0
Sloane, Battu and Seaman (1996)	1986	UK	WA	30.6	17.1
Sloane, Battu and Seaman (1999)	1986	UK	WA	30.6	17.1
Tsang, Rumberger and Levin (1991)	1972-1973	USA	JA	52.0/68.0	
			WA	29.0/23.0	

Table 3 shows how the incidence of overeducation varies across population subgroups. It presents headcount estimates of the proportion of a population subgroup over or undereducated, with groups classified by age, country of birth, location, household characteristics, education and job characteristics. Separate estimates of are shown for the male and female samples.

Somewhat surprisingly, the incidence of overeducation is lower among females than males, and women are also more likely to be undereducated. Males that are immigrants from an English speaking background (ESB) have a substantially higher rate of overeducation than their Australian born counterparts. This may be a result of labour market discrimination or higher levels of education among immigrants. For males there appears to be no clear relationship between the location of residence and the incidence of overeducation. However, for females overeducation is strictly increasing in the degree of remoteness of the local labour market. This provides preliminary support for spatial mobility theory. Marriage appears to have a positive influence on the quality of job match, such that the incidence of overeducation is lower and undereducation higher among married persons.

There is a strong relationship between education and the incidence of over and undereducation: individuals with secondary education have the highest rate of overeducation whilst a large proportion of those with vocational qualifications or

incomplete secondary education are undereducated. This suggests that educational mismatch is not only a problem for highly educated individuals, but rather is a problem faced by workers across all levels of educational attainment.

For women, the incidence of overeducation is considerably lower for those working in the public sector. This may be due to the more defined career structures and better promotion prospects in the public sector. In addition, overeducation is lower among workers in medium-sized firms. The incidence of overeducation is decreasing, and undereducation increasing, in age and years of tenure. The relationship between age and the incidence of over and undereducation is shown in Chart 1. This relationship is in accordance with the predictions of the career mobility theory.

Table 3: Incidence of over and undereducation across population subgroups, as a proportion of all persons in the population subgroup (%)

	Overeducated		Undereducated	
	Male	**Female**	**Male**	**Female**
Age group (years)				
18-24	40.7	40.0	6.8	10.0
25-34	30.0	29.3	12.0	17.7
35-44	28.5	23.7	21.6	22.0
45-54	21.8	17.1	21.8	29.0
Country of birth				
Australian born	26.6	26.3	18.1	20.0
English speaking background	41.6	24.1	11.7	21.7
Non-English speaking background	29.6	19.5	16.7	34.2
Location of residence				
Major city	30.5	24.1	16.6	20.9
Inner regional	25.8	25.3	18.1	20.4
Outer regional and remote	28.1	30.4	19.5	23.2
Household characteristics				
Married	26.5	23.4	21.0	22.7
Unmarried	32.0	29.5	11.3	18.6
Preschool-aged children in household	27.3	20.0	19.5	20.0
Highest education[11]				
Degree	23.9	19.0	0.0	0.0
Diploma	18.4	22.4	30.6	29.9
Secondary	35.9	33.3	25.2	26.1
Incomplete secondary	0.0	0.0	41.3	44.9
Job characteristics				
Public sector	26.2	19.1	17.2	24.1
Private sector	29.6	29.3	17.3	19.3
Firm size				
Fewer than 25 employees	34.4	29.9	14.9	19.5
25-300 employees	25.6	22.0	17.8	22.0
More than 300 employees	28.6	35.6	20.0	20.0
Prefer more hours	43.6	36.6	9.7	20.7
Prefer fewer hours	25.1	23.2	17.1	18.6
Tenure				
Fewer than 5 years	31.7	32.2	12.5	17.0
5 or more years	25.5	17.6	22.5	23.3
Overall	**28.7**	**25.7**	**17.1**	**21.0**

[11] By definition, an individual with a degree cannot be undereducated, and those with incomplete secondary education cannot be overeducated.

Chart 1: Incidence of over and undereducation, by age (%)

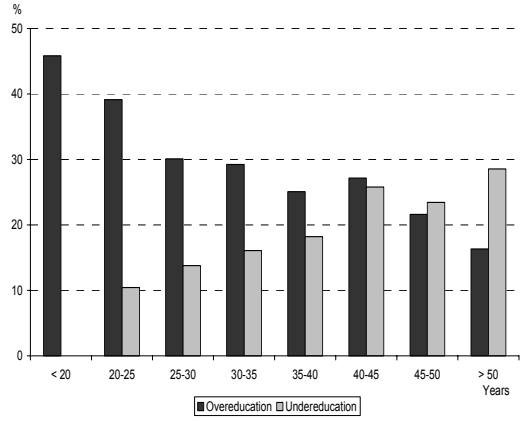

Table 3 also shows that the incidence of overeducation is substantially higher among individuals who would prefer to work more hours, either in their current or alternative workplace. Indeed, 43.6 per cent of males employed in jobs in which their time is underutilised are also underutilising their skills. This provides some preliminary evidence to suggest that a positive relationship exists between time-related and skill-related underemployment.

IV. Factors influencing the incidence of overeducation

In the previous section, the dataset and measurement techniques were described. Examination of basic descriptive statistics pointed to a number of factors that appear to be related to labour market mismatch. This section looks at these factors in more detail.

To determine the factors that influence the probability an individual is overeducated, exactly matched or undereducated it is conventional to use a multinomial logit (MNL) model (see McGoldrick and Robst 1996; Sloane *et al* 1996; Sloane *et al* 1999; Battu and Sloane 2004; Chevalier 2003). However, the MNL model may not be the best approach. If individuals choose unemployment over overeducation, the labour market match would not be independent of the participation decision and consequently the MNL model would be misspecified. Ideally, a nested logit model, which nests the job match in the participation decision, would be estimated to understand how individual and job characteristics impact on labour market match. However, degrees of freedom problems prevented the use of the nested logit approach in this study. Hence this study uses the MNL model to determine the

factors that influence the incidence of over and undereducation in the Australian labour market, despite its potential limitations.

Selected individual, spatial mobility and job characteristics that may impact on the quality of an individual's job match are included as explanatory variables. Individual characteristic variables include gender, marital status, number of children, a dummy variable for the presence of preschool-aged children in the respondent's household, and immigrant status. Five additional variables capture socio-economic characteristics: whether the respondent was married or had children at the age of 20, is an owner-occupier, and whether the respondent's current partner is employed or self-employed.

The respondent's age and years of tenure in the current workplace capture an individual's additional human capital.[12] Job characteristic variables include firm size, sector of employment, and a dummy variable describing whether the position is casual or permanent. In addition, two variables capturing whether an individual would prefer to work more or fewer hours in their current or alternative job are included. Time-related underemployment arises when individuals are willing and available to work additional hours at the going wage, but are unable to find the additional work.[13] Consequently, the prefer more hours variable is used as a proxy for time-related underemployment in order to test whether time-related and skill-related underemployment are interrelated.

To test the spatial mobility theory, a dummy variable describing whether the respondent has access to a motor vehicle, and two location variables – inner regional and outer regional and remote – are included in the analysis. The reference location variable is major city. The access to vehicle variable is used to capture an individual's capacity to commute, and the location variables to capture the size of the local labour market.

[12] Including the education variables in the MNL model would represent a misspecification error, as the education variables are discrete rather than continuous.

[13] ABS defines underemployed persons as those who worked less than 35 hours in the reference period, want to work more hours, and are available to do so (ABS 2003b, p.17). The prefer more hours variable captures individuals working both part and full-time who are dissatisfied with the number of hours they are working. As the prefer more hours variable does not capture worker availability, it may overstate the extent time-related underemployment. However by including full-time workers, the prefer more hours variable may more accurately reflect the extent of excess supply of labour hours (Wilkins 2004, p.11).

Table 4 presents the MNL results. For the combined and female samples, age has a negative and significant impact on the probability an individual is overeducated, and a positive impact on undereducation. These results are in accordance with the predictions of career mobility theory. Support for the career mobility theory can also be found in the positive and statistically significant effect of tenure on the probability of undereducation for the combined and male samples.

The presence of preschool-aged children has a large and significant negative impact on the probability a woman is overeducated. This surprising result may reflect the recent trend towards women having children when they are older and more established in their careers, and later returning to resume their careers after the birth of their child. This hypothesis gains some support from the data: 41.7 per cent of women with preschool-aged children are in the manager and administrator or professional occupational classes, compared to 29.2 per cent of women without preschool-aged children. Moreover, women with preschool-aged children are, on the whole, more educated: 43.9 per cent of women with preschool-aged children have either a degree or diploma compared with only 36.4 per cent of women without preschool-aged children. To further test this hypothesis, an interaction term between the preschool-aged children dummy and a dummy variable equal to one if the respondent had her first child at 30 years of age or older was included in the model. The coefficient was found to be negative, but not significant at conventional levels.

Whilst the presence of preschool-aged children reduces the probability a woman will be overeducated, the incidence of overeducation is increasing in the number of children. This implies that women with older children are more likely to be overeducated than both women without children, and those with preschool-aged children. This result is partially due to cohort effects. Women with older children are from earlier cohorts, such that the median year in which women with preschool-aged children were born is 1964, whilst the median year of birth of those with older children is 1954. Women from earlier cohorts are likely to have less education, had their children at a younger age, and had more discontinuous work histories. Some evidence to support this can be found in data: the median age women with preschool-aged children gave birth to their first child is 27.5 years compared with 24 years for women with older children. In addition, the median education level for

women with preschool-aged children is diploma level compared with secondary school for women with older children.

Table 4: Factors influencing the incidence of over and undereducation, MNL

	Combined		Male		Female	
Variable	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
Overeducation						
Individual characteristics						
Male	0.130	0.146				
Age	- 0.023**	0.011	- 0.012	0.016	- 0.034**	0.016
Marital status	0.172	0.191	0.297	0.299	0.079	0.267
Number of children	0.077	0.072	0.052	0.107	0.087	0.107
Preschool-aged children	- 0.364*	0.198	- 0.110	0.284	- 0.716**	0.298
Immigrant from ESB	0.347*	0.203	0.780***	0.286	- 0.056	0.311
Immigrant from NESB	0.129	0.283	0.361	0.369	- 0.169	0.484
Parent at age 20	0.422	0.261	0.539	0.475	0.321	0.327
Married at age 20	- 0.201	0.222	0.011	0.418	- 0.254	0.277
Partner employed	- 0.261	0.169	- 0.361	0.238	- 0.109	0.263
Partner self-employed	- 0.019	0.289	0.231	0.586	0.105	0.365
Owner-occupier	- 0.126	0.171	- 0.330	0.257	- 0.012	0.244
Spatial mobility						
Access to vehicle	- 0.196	0.261	- 0.263	0.389	- 0.168	0.391
Inner regional	0.001	0.160	- 0.143	0.244	0.126	0.222
Outer regional and remote	0.238	0.176	- 0.004	0.262	0.467*	0.249
Job characteristics						
Large firm	0.494*	0.262	0.361	0.359	0.708*	0.406
Small firm	0.214	0.175	0.352	0.261	0.109	0.250
Public sector	- 0.031	0.196	0.148	0.297	- 0.169	0.278
Permanent	- 0.060	0.169	0.203	0.293	- 0.247	0.221
Tenure	- 0.007	0.013	- 0.003	0.017	- 0.014	0.019
Prefer more hours	0.471**	0.217	0.481	0.332	0.593**	0.301
Prefer fewer hours	- 0.083	0.158	- 0.171	0.226	0.047	0.232
Constant	0.173	0.439	- 0.306	0.677	0.663	0.606
Undereducation						
Individual characteristics						
Male	- 0.186	0.175				
Age	0.028**	0.012	0.019	0.020	0.036**	0.017
Marital status	0.206	0.222	0.633	0.398	- 0.022	0.298
Number of children	0.015	0.079	0.108	0.125	- 0.105	0.112
Preschool-aged children	0.165	0.213	0.037	0.345	0.237	0.298
Immigrant from ESB	- 0.152	0.251	- 0.464	0.453	0.031	0.317
Immigrant from NESB	0.384	0.288	0.099	0.467	0.632	0.404
Parent at age 20	- 0.285	0.317	- 1.170	0.769	- 0.051	0.365
Married at age 20	0.478**	0.212	0.864*	0.456	0.482*	0.257
Partner employed	- 0.240	0.195	- 0.181	0.296	- 0.262	0.291
Partner self-employed	0.302	0.282	0.603	0.643	0.288	0.359
Owner-occupier	0.067	0.208	- 0.462	0.347	0.417	0.284
Spatial mobility						
Access to vehicle	- 0.047	0.354	0.348	0.737	- 0.179	0.421
Inner regional	0.045	0.178	0.070	0.295	0.000	0.235
Outer regional and remote	0.258	0.201	0.079	0.329	0.327	0.273
Job characteristics						
Large firm	0.159	0.304	0.087	0.414	0.352	0.480
Small firm	0.011	0.214	0.093	0.345	0.102	0.303
Public sector	- 0.097	0.212	- 0.429	0.337	0.149	0.299
Permanent	0.308	0.209	0.561	0.474	0.159	0.250
Tenure	0.021*	0.012	0.038**	0.017	0.001	0.018
Prefer more hours	0.183	0.286	- 0.031	0.581	0.269	0.355
Prefer fewer hours	- 0.330*	0.180	- 0.283	0.273	- 0.399	0.251
Constant	- 2.550***	0.592	- 3.082***	1.145	- 2.642***	0.744
Number of observations	1291		589		702	
Log likelihood	- 1249.0		- 556.3		- 673.7	

Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10

For the combined and male samples, the probability of being overeducated relative to being in an exact match job is significantly higher for immigrants from an ESB. This effect arises as male immigrants from an ESB have significantly higher education levels that their Australian born counterparts, such that 29.3 per cent of male immigrants have a degree qualification, compared with only 21.1 per cent of Australian born males. Immigrants are also likely to encounter problems associated with obtaining a job to match their education. In particular, immigrants are likely to have less flexibility in job search due to visa requirements, encounter problems in translating overseas qualifications, and may also face labour market discrimination. Hence it is probable that higher education levels of immigrant males combined with problems in job matching is causing overeducation to be higher among this group.

Individuals who were married at the age of 20 are significantly more likely to be undereducated than those who are either unmarried, or who married at an older age. This result arises in part because the married at 20 variable captures cohort effects: the median birth year of individuals who were married at 20 is 1955 compared to 1962 for respondents not married at 20. This finding is not surprising; individuals in earlier cohorts are more likely to be undereducated as they have more experience, on-the-job training and tenure, and as a consequence have moved up the occupational ranks to positions for which the educational requirements exceed their formal qualifications. This effect is amplified by lower average education levels of earlier cohorts.

The MNL results also provide some support for the spatial mobility theory. For the female sample, the incidence of overeducation is negatively related to local labour market size and distance from urban conglomerations. Indeed, women living in outer regional or remote areas have a significantly higher incidence of overeducation than their counterparts in inner regional areas and major cities. To test the differential overeducation theory developed by Frank (1978), which suggests married women in small local labour markets are more likely to be overeducated, marital status-location interaction terms were included in the model for the female sample. Neither of the coefficients on the interaction terms were statistically significant, which suggests the differential overeducation theory does not work well to explain overeducation among married women in the Australian labour market.

For each of the samples, access to a motor vehicle has no discernible effect on the probability of over or undereducation. This apparently contradicts the spatial mobility theory, which predicts that those with a lower commuting tolerance are more likely to be overeducated. However, this result may be due to endogeneity. If overeducation is negatively correlated with earnings, then the overeducated are less likely to be able to afford a motor vehicle.

For the female and combined samples, working for a firm with over 300 employees significantly increases the probability an individual is overeducated. For males the effect is also positive, but insignificant. This relationship can be explained by the signalling model. Chatterji *et al* (2003) develop a model in which signalling arises due to imperfect information and positive monitoring costs. As monitoring costs are increasing in firm size, this model predicts that large firms will require a larger signal; hence overeducation is expected to be more prevalent in large firms. These results provide some support for this hypothesis.

These results also indicate that individuals who would prefer to work more hours have a higher probability of being overeducated. These results are significant at the 5 per cent level for the combined and female samples. This suggests that there is a positive relationship between time-related and skill-related underemployment, such that individuals in jobs in which their time is underutilised are also more likely to be underutilising their skills. This is an important result. It suggests that overeducated workers are likely to be in the secondary labour market where jobs are low-skilled, part-time or casual and often have compressed age-earnings profiles and fewer opportunities for promotion. This link between time-related and skill-related underemployment suggests that labour market outcomes for overeducated workers are poor. Indeed, if overeducated workers are consigned to secondary labour markets they may experience persistent overeducation and time-related underemployment throughout their careers.

V. Effects of overeducation

The previous section was concerned with understanding the factors that influence the incidence of over and undereducation. The focus in this section shifts to determining how labour market mismatch affects outcomes for individuals. Through looking at

the impact of labour market mismatch on earnings and by testing the relationship between job satisfaction and the quality of job match, the economic costs of over and undereducation are assessed.

i. Earnings

To assess the costs of overeducation for an individual earnings regressions are run. The approach used is an adaptation of the Mincer human capital specification. The human capital model suggests that an individual's human capital determines his or her productivity, which in turn determines earnings. Under the Mincer specification income is a function of years of formal education, q_i, and is given by:

$$\ln Y_i = \alpha_0 + \alpha_1 q_i + X_i'\beta + \lambda_i + U_i \qquad U_i \sim i.i.d\ \mathrm{N}\left(0, \sigma^2\right) \tag{1}$$

Where Y_i is income and X_i is a vector of other characteristics for individual i that includes the additional components of human capital, experience and training.[14] As positive hourly wages are only observed for employed workers, a selectivity bias can arise when estimating earnings equations. Hence to account for incidental truncation in the sample, Heckman's two step selection method is used.

In contrast to human capital theory, the job competition model suggests that productivity is related to job rather than worker characteristics. Consequently earnings are determined by the educational requirements of a job, rather than educational attainment of workers. Hence, under the job competition model, earnings are determined by:

$$\ln Y_i = \alpha_0 + \alpha_1 q_i^r + X_i'\beta + \lambda_i + U_i \tag{2}$$

Where q_i^r represents the education required to obtain the job.

Under the assignment model, wages play a central role in matching workers with differing educational levels to jobs with differing skill requirements. This implies that both demand and supply side factors impact on earnings. Hence earnings are determined by:

$$\ln Y_i = \alpha_0 + \alpha_1 q_i^r + \alpha_2 q_i^s + \alpha_3 q_i^d + X_i'\beta + \lambda_i + U_i \tag{3}$$

Where q_i^s represents surplus education, or the education in excess of that which is required for the job, and q_i^d is deficit education. Actual education is given by:

$$q_i = q_i^r + q_i^s - q_i^d \tag{4}$$

[14] For the following specifications of the earnings equation, the errors are assumed to be independently and identically normally distributed with a mean of zero and variance of σ^2. All equations are sourced from Sloane *et al* (1999).

The specification in Equation 3 has been termed the over-required-undereducation (ORU) earnings equation, where the return to education is decomposed into the returns to over, required and undereducation.[15] This study uses the ORU earnings equation to estimate the private costs of labour market mismatch.

Most studies use information on the years of schooling of respondents to estimate the returns to each year of education in excess of the job requirements (see Groot and Maassen van den Brink 2000). The NLC survey does not decompose the educational attainment of the respondent into years of schooling; hence in estimating the earnings equation the required education level appears as a set of dummy variables for degree, diploma and secondary requirements. Incomplete secondary schooling is the reference category. Consequently the results are interpreted as the per cent premium earned by individuals with jobs that require a degree, diploma or secondary education, relative to income earned by individuals with incomplete secondary schooling in jobs requiring that level.

To determine the earnings premium or penalty for over and undereducation, two categorical variables are included in the ORU earnings equation. The overeducation and undereducation variables capture the extent of labour market mismatch. These variables take a value between 0 and 3, with 3 representing acute labour market mismatch. The coefficient on the overeducation (undereducation) variable represents the per cent premium (penalty) earned by workers in positions where the education requirements are one level below (above) their actual education level, relative to exactly matched workers in the same position.

Factors that can impact on productivity and earnings are controlled for by the inclusion of individual characteristic variables (male, age, age squared, marital status, number of children, preschool-aged children, immigrant status, health status), the spatial mobility variable access to vehicle, and job characteristic variables (firm size, sector of employment, supervisory or managerial responsibilities, permanent

[15] The ORU earnings equation does not precisely capture the differences in comparative advantage that are central to the assignment model as it allows the level of productivity to vary over jobs and workers, but fixes the ratio between the productivities of workers with different education levels across jobs, and the ratios of productivities of different jobs across workers with the same level of education (Hartog 2000, p.141).

position, tenure).[16] The ORU earnings equation results are presented in Table 5 and the participation equation results are in Appendix B.[17]

Workers in jobs which require a degree earn 53.6 per cent more per hour than individuals working in positions that require incomplete secondary education. The earnings premium for education is substantially higher for females than for males, such that women in jobs with degree requirements earn 60.5 per cent more than those in jobs which require incomplete secondary schooling, whereas males earn only 43.4 per cent more. Interestingly, workers in jobs which require vocational qualifications earn a very similar premium to those in positions with secondary requirements: 23.9 per cent and 22.8 per cent, respectively. Hypothesis tests show that for each of the samples the coefficients on the diploma requirement and secondary schooling requirement variables are not significantly different.

Table 5: ORU earnings equation, OLS

	Combined		Male		Female	
Variable	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
Job education requirements						
Degree	0.536***	0.076	0.434***	0.096	0.605***	0.112
Diploma	0.239***	0.072	0.154	0.099	0.296***	0.106
Secondary	0.228***	0.057	0.117	0.078	0.324***	0.090
Labour market mismatch						
Overeducation	0.111***	0.038	0.013	0.052	0.202***	0.055
Undereducation	- 0.015	0.032	0.003	0.036	- 0.036	0.051
Individual characteristics						
Male	0.185***	0.043				
Age	0.099***	0.019	0.095***	0.025	0.116***	0.026
Age squared	- 0.001***	0.000	- 0.001***	0.000	- 0.001***	0.000
Marital status	0.063	0.048	0.144*	0.076	0.013	0.063
Number of children	- 0.041**	0.019	- 0.035	0.024	- 0.049*	0.028
Preschool-aged children	0.084*	0.047	0.087	0.055	0.113	0.075
Immigrant from ESB	0.062	0.056	0.110*	0.066	0.033	0.084
Immigrant from NESB	- 0.255**	0.100	- 0.179	0.109	- 0.318*	0.181
Health	- 0.079**	0.033	- 0.120***	0.044	- 0.027	0.047
Spatial mobility						
Access to vehicle	0.064	0.101	0.138	0.140	- 0.059	0.131
Job characteristics						
Large firm	0.150**	0.069	0.256***	0.074	- 0.005	0.139
Small firm	- 0.151***	0.052	- 0.013	0.085	- 0.261***	0.072
Public sector	0.045	0.042	0.132**	0.065	- 0.015	0.057
Supervisor/manager	0.089**	0.038	0.063	0.052	0.109*	0.056
Permanent	- 0.001	0.053	0.096	0.091	- 0.057	0.066
Tenure	- 0.001	0.003	0.003	0.004	- 0.009*	0.005
Constant	0.436	0.340	0.515	0.468	0.293	0.467
Inverse Mills Ratio	0.110	0.118	0.215	0.180	- 0.024	0.133
Number of observations	1219		567		652	
Adjusted R-squared	0.193		0.224		0.166	

Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10
Dependent variable: log of gross hourly income, including wage and salary, and business income. Hours refer to the total number of hours worked by the respondent in the week prior to the survey.
Note: White's heteroscedasticity consistent standard errors are reported.

[16] The inner regional and outer regional and remote variables were also included, yet were found to be jointly insignificant and were excluded from the final specification.
[17] The participation equation includes highest education, male, age, age squared, marital status, number of children, preschool-aged children, immigrant from ESB, immigrant from NESB, owner-occupier, health status, other income and access to vehicle as explanatory variables.

For the combined and female samples, overeducation has a large positive and significant impact on earnings.[18] Indeed, workers whose actual education exceeds the education requirements for the job by one level earn a premium of 11.1 per cent over that earned by correctly matched workers in the same job. These results are consistent with findings from other studies, where the premium to one year of overeducation is found to be between 1.9 and 6.6 per cent (see Groot and Maassen van den Brink 2000). The magnitude of the premium to overeducated workers is higher in this study as education is measured in levels not years.

There is also a small but statistically insignificant earnings penalty to undereducation for the combined and female samples. In the male sample, undereducated workers earn a small premium over correctly matched workers in the same position. However, this effect falls a long way short of being statistically significant. This result contrasts to the statistically significant earnings penalty of 1.3 to 7.1 per cent for each year of undereducation found by some studies (see Groot and Maassen van den Brink 2000). However, other studies have also found undereducation to have no discernible effect on earnings (Hersh 1991; Mendes de Oliveira *et al* 2000).

These results show that overeducated workers earn less than exactly matched workers with the same level of education. This earnings penalty arising from overeducation reduces the returns to investment in education. In the neoclassical model, the optimal response to lower returns is to reduce the level of investment. Yet the last three decades has seen not only rapid growth in educational participation in Australia, but also a shift away from vocational education and training towards university education. Even between 1991 and 2003 the number of people aged 15-64 participating in education and training increased by 27.5 per cent, such that by 2003, 19 per cent of all working aged persons were participating in some form of education or training (ABS 2003c, p.3). The lack of congruence between returns to investment in education and participation rates suggests that education continues to have a positive value as a signal in the Australian labour market. Moreover, as public subsidisation of education means that individuals are not required to pay up-front for their education and do not bear the full cost of their investment, individuals have a strong incentive to invest in education even when the returns are marginal. In

[18] Overeducation has no significant effect on the earnings of males, yet immigrants from an ESB earn a substantial premium. This variable may be capturing some of the effect of overeducation on earnings, given that for males overeducation and being an immigrant from an ESB are strongly correlated.

addition, education has consumption benefits which are not captured in the ORU earnings equation, and these benefits further increase the incentives to invest.

The ORU results presented above are consistent with findings from the general labour market literature: earnings are significantly higher for males, there is a quadratic relationship between age and earnings, immigrants from a non-English speaking background (NESB) earn less than their Australian born counterparts, and earnings are increasing in firm size. In addition, poor health has a significant negative impact on earnings. Consistent with the findings from the MNL model, the number of children has a negative impact, and the presence of preschool-aged children has a positive impact on earnings.

Table 6 shows how the earnings premium to education varies by job match. This is calculated using the coefficient estimates for the over, required and undereducation variables from the combined sample. The rows show the earnings premium to the actual level of education above the earnings of individuals who have not completed secondary school in jobs with incomplete secondary education requirements. The diagonal elements of the matrix represent the returns to an exact match, with those above the diagonal representing the returns to overeducation, and below the diagonal the returns to undereducation. Some anomalies arise as the earnings premiums for diploma and secondary schooling requirements are not significantly different.

Table 6: Earnings premiums by labour market match, combined sample (%)

	Required education			
Actual education	*Degree*	*Diploma*	*Secondary*	*Incomplete secondary*
Degree	53.6	35.0	45.0	33.3
Diploma	52.1	23.9	33.9	22.2
Secondary	50.7	22.4	22.8	11.1
Incomplete secondary	49.2	21.0	21.4	0

The results from the ORU model highlight that overeducation is costly for individuals. Indeed, those in positions for which they are overqualified earn 10 to 20 per cent less than those with the same level of education in positions for which they are exactly matched. This represents a sizable penalty to the overeducated worker.

ii. Job satisfaction

Overeducation creates economic costs both through reducing individual earnings, and by affecting job satisfaction. Tsang and Levin (1985) develop a model in which overeducation is related to job satisfaction and quit intentions. In this model, workers in jobs for which they are overqualified have lower job satisfaction. This is because more educated workers set a high priority on work that is challenging and provides them with autonomy. When workers are placed in positions in which their skills are underutilised, the degree of challenge and autonomy of the work does not match their expectations or requirements. This results in lower job satisfaction. As work effort and productivity are positively related to job satisfaction, overeducated workers are less productive.[19]

Understanding the impact of labour market mismatch on productivity involves estimating the extent to which being overeducated, exactly matched or undereducated explains variations in the level of job satisfaction. Two measures of job satisfaction are used: satisfaction with how interesting the work is, and satisfaction with the level of responsibility. These indicators are measured on ordinal scales, increasing in the level of job satisfaction. Hence ordered probit models are used analyse the effect of job match on satisfaction and productivity.

In these models the explanatory variables include the over, required and undereducation variables, and a vector of individual and job characteristics. As in the ORU earnings equation, the over and undereducation variables are categorical variables which capture the extent of labour market mismatch. In estimating the productivity effects of overeducation it is important to use variables that capture the extent of labor market mismatch as job dissatisfaction is likely to be higher for individuals in very poor job matches. The individual and job characteristics likely to affect job satisfaction that are used as controls include gender, age, marital status, immigrant status, health status, firm size, sector of employment, permanent position and tenure. In addition, three variables are included that capture the importance individuals place on different aspects of the job: promotion opportunity, good pay, and having a sense of satisfaction with their achievements. These variables control for variations in job satisfaction attributable to differences in preferences.

[19] Overeducated workers are also more likely to have higher rates of absenteeism and turnover, to engage in adverse work behaviours such as sabotage and drug use, and have poorer physical and mental health (Tsang and Levin 1985, p.97).

Table 7: Job satisfaction models

Model 1: How interesting the work is, ordered probit

	Combined		Male		Female	
Variable	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
Job education requirements						
Degree	0.581***	0.105	0.585***	0.153	0.574***	0.149
Diploma	0.416***	0.101	0.273*	0.145	0.526***	0.145
Secondary	0.295***	0.093	0.340**	0.139	0.283**	0.127
Labour market mismatch						
Overeducation	- 0.049	0.051	- 0.096	0.070	- 0.007	0.077
Undereducation	- 0.017	0.056	- 0.043	0.079	0.005	0.082
Individual characteristics						
Male	- 0.042	0.067				
Age	0.005	0.004	0.011*	0.006	0.003	0.006
Marital status	0.121*	0.067	0.082	0.103	0.154*	0.091
Immigrant from ESB	- 0.116	0.102	- 0.322**	0.146	0.001	0.151
Immigrant from NESB	- 0.286**	0.136	- 0.314*	0.181	- 0.288	0.206
Health	- 0.130***	0.050	- 0.273***	0.069	- 0.005	0.074
Job characteristics						
Large firm	- 0.004	0.133	- 0.004	0.175	- 0.014	0.205
Small firm	0.092	0.082	0.134	0.118	0.070	0.118
Public sector	0.122	0.088	0.031	0.130	0.175	0.123
Permanent	- 0.049	0.081	- 0.094	0.137	- 0.043	0.102
Tenure	- 0.008	0.005	- 0.010	0.007	- 0.003	0.008
Work importance						
Promotion opportunities	0.003	0.038	- 0.034	0.062	0.034	0.049
Good pay	- 0.047	0.049	- 0.033	0.077	- 0.074	0.067
Sense of satisfaction	0.361***	0.057	0.308***	0.082	0.408***	0.080
Limit 1	- 0.897***	0.316	- 1.388***	0.509	- 0.420	0.432
Limit 2	0.032	0.310	- 0.402	0.476	0.446	0.445
Limit 3	0.126	0.309	- 0.338	0.475	0.570	0.445
Limit 4	1.669***	0.314	1.262***	0.474	2.092***	0.457
Number of observations	1340		622		718	
Log likelihood	- 1318.8		- 607.2		- 700.9	

Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10

Dependent variable: Level of satisfaction with how interesting the respondent's work is, where 0 = very dissatisfied, 1 = dissatisfied, 2 = mixed feelings, 3 = satisfied, 4 = very satisfied

In Model 1 the dependent variable captures the respondent's satisfaction with how interesting the work is. The results are presented in Table 7. There exists a positive and significant relationship between the required education level and job satisfaction with how interesting the work is for each of the samples. This implies respondents with higher level jobs are more likely to find the tasks they perform at work interesting. For all samples, individuals who are overeducated are likely to be dissatisfied with how interesting their work is relative to exactly matched workers in the same job. Whilst this is in accordance with the predictions of the Tsang and Levin model, the coefficients on overeducation are small in magnitude and the effects fall some way short of being statistically significant.

Table 8 presents the results from Model 2, in which the dependent variable is satisfaction with the level of responsibility associated with the respondent's job. Overeducated workers are significantly less likely to be satisfied with the level of responsibility. Indeed, the predicted probability that a 30 year old unmarried male

with a degree will be dissatisfied or very dissatisfied with the level of responsibility is 0.06 for those in jobs with degree requirements, and 0.16 for those in jobs with only diploma requirements.[20] The coefficient on overeducation is large and statistically significant at the 5 per cent level for the combined and male samples. Undereducation has a positive and significant effect on job satisfaction for females.

Table 8: Job satisfaction models

Model 2: Level of responsibility, ordered probit

	Combined		Male		Female	
Variable	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
Job education requirements						
Degree	0.014	0.110	- 0.061	0.169	0.031	0.149
Diploma	- 0.100	0.105	- 0.397**	0.155	0.126	0.151
Secondary	- 0.072	0.093	- 0.057	0.145	- 0.104	0.128
Labour market mismatch						
Overeducation	- 0.125**	0.050	- 0.207***	0.074	- 0.062	0.069
Undereducation	0.057	0.053	- 0.017	0.075	0.159**	0.076
Individual characteristics						
Male	- 0.057	0.067				
Age	0.001	0.004	0.006	0.007	- 0.001	0.006
Marital status	0.086	0.068	0.085	0.105	0.109	0.093
Immigrant from ESB	- 0.202**	0.100	- 0.390***	0.138	- 0.116	0.144
Immigrant from NESB	- 0.164	0.125	0.016	0.183	- 0.412**	0.167
Health	- 0.201***	0.050	- 0.340***	0.074	- 0.112*	0.068
Job characteristics						
Large firm	- 0.138	0.119	0.062	0.159	- 0.427**	0.182
Small firm	0.216**	0.085	0.218*	0.128	0.155	0.119
Public sector	0.090	0.090	0.251*	0.132	- 0.096	0.127
Permanent	- 0.012	0.081	- 0.138	0.141	0.062	0.099
Tenure	- 0.004	0.005	- 0.009	0.007	0.004	0.008
Work importance						
Promotion opportunities	- 0.037	0.035	- 0.047	0.054	- 0.026	0.047
Good pay	0.035	0.050	- 0.006	0.079	0.033	0.064
Sense of satisfaction	0.277***	0.052	0.138*	0.074	0.393***	0.075
Limit 1	- 1.835***	0.305	- 3.011***	0.486	- 1.082***	0.407
Limit 2	- 0.767***	0.290	- 1.703***	0.447	- 0.162	0.399
Limit 3	- 0.721**	0.290	- 1.661***	0.446	- 0.111	0.397
Limit 4	1.161***	0.295	0.290	0.447	1.780***	0.408
Number of observations	1338		621		717	
Log likelihood	- 1210.9		- 548.7		- 642.1	

Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10

Dependent variable: Level of satisfaction with the level of responsibility associated with the respondent's job, where 0 = very dissatisfied, 1 = dissatisfied, 2 = mixed feelings, 3 = satisfied, 4 = very satisfied

Given that satisfaction with the level of responsibility is likely to be negatively related to productivity, the significant relationship between job satisfaction and overeducation implies that overeducated workers are likely to be less productive employees than exactly matched workers in the same job. Whilst this provides evidence to suggest that the economic costs of overeducation, in terms of reduced productivity and allocative efficiency, are not insignificant, care must be taken in interpreting these results. Overeducated workers may respond to their dissatisfaction

[20] This is calculated using the coefficient estimates from the male sample, assuming that the person is Australian born, in excellent health, working in a medium sized firm in the private sector, has 5 years of tenure, and believes that pay, promotion opportunities and a sense of satisfaction at work are important.

with the level of responsibility in their jobs by increasing work effort in order to secure a promotion. This would suggest that the economic costs of overeducation are lower than they first appear. Moreover, it is difficult to determine the direction of causality: overeducation may be causing lower job satisfaction, or lower job satisfaction may be causing individuals to underreport job education requirements.

Nonetheless, the negative relationship found between overeducation and job satisfaction provides some evidence to suggest that overeducation not only leads to adverse outcomes for individuals, but is also likely to have a negative impact on productivity and impose not insignificant costs on society.

VI. Conclusion

This study examined the incidence and effects of overeducation in the Australian labour market in order to gain insight into the ways in which skill-related underemployment influences individual outcomes and the Australian economy. Using data from the 1997 NLC survey, this study found that the incidence of labour market mismatch is over 45 per cent, with 27.1 per cent of workers holding positions for which their actual education exceeds the educational requirements, and 19.2 per cent placed in positions for which they are underqualified. This is consistent with the findings from the U.S. and U.K.

Examination of the factors that influence the incidence of overeducation showed that those who are young and have fewer years of tenure in their current job are significantly more likely to be overeducated. This is broadly consistent with the predictions of the career mobility theory. Other factors that influence the probability an individual is overeducated include immigrant status, firm size and the location of residence. Interestingly, the presence of preschool-aged children has a strong positive effect on labour market outcomes for women, such that women with preschool-aged children are more likely to have a good quality job match and have high earnings. These results are indicative of the recent trend towards highly educated women having children at an older age, once they are more established in their careers, and then returning to employment after the birth of their child.

This study extended previous research on overeducation by identifying a link between time-related and skill-related underemployment. It was found that individuals employed in positions in which their time is underutilised are also more likely to be underutilising their skills. This has important implications for labour market outcomes for individuals, and consequently warrants further research.

The economic costs of overeducation were estimated firstly by looking at the relationship between labour market mismatch and earnings. As found in earlier studies, overeducated individuals earn more than their exactly matched counterparts in the same job but less than similarly educated workers placed in jobs for which their education matches the requirements. This study found that overeducated workers earn between 10 and 20 per cent less than similarly educated workers in exact match jobs. By contrast, undereducation was found to have no discernible effect on earnings. These results indicate that the private costs of overeducation in Australia are not insignificant.

Secondly the costs of overeducation were evaluated through examining the relationship between labour market mismatch and job satisfaction. This study found evidence to suggest that overeducated workers are more likely to be dissatisfied with the level of responsibility associated with their jobs, relative to exactly matched workers in the same position. As job satisfaction is positively related to productivity, these results suggest that overeducation may adversely affect the productivity of the Australian economy.

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Appendix A: Variable definitions

Table 9: Variable definitions

Variable	Definition
Access to vehicle	Dummy = 1 if respondent has access to a motor vehicle when required, = 0 otherwise
Age	Age of respondent, years
Degree (required)	Dummy = 1 if the respondent is required to have a degree qualification for their job, = 0 otherwise
Diploma (required)	Dummy = 1 if the respondent is required to have a diploma qualification for their job, = 0 otherwise
Good pay	Importance respondent places on the amount earned in their job, = 1 not important, = 2 somewhat important, = 3 important, = 4 very important
Health status	Self assessed health status, = 1 excellent, = 2 good, = 3 fair, = 4 poor
Immigrant from ESB	Dummy = 1 if respondent was born in Canada, New Zealand, South Africa, United Kingdom or United States, = 0 otherwise
Immigrant from NESB	Dummy = 1 if respondent was born in an non-English speaking country, = 0 otherwise
Inner regional	Dummy = 1 if respondent lives in a inner regional area, under the ASGC Remoteness classification, = 0 otherwise
Large firm	Dummy = 1 if the firm employs more than 300 workers, = 0 otherwise
Male	Dummy = 1 if male, = 0 if female
Marital status	Dummy = 1 if legally married, =0 otherwise
Married at age 20	Dummy = 1 if respondent was married when they were 20 years of age or younger, = 0 otherwise
Number of children	Number or natural or adopted children of respondent
Other income	All income earned by respondent not from wages, salaries and business income, $ 000s.
Outer regional and remote	Dummy = 1 if respondent lives in a outer regional, remote or very remote area, under the ASGC Remoteness classification, = 0 otherwise
Owner-occupier	Dummy = 1 if respondent owns their own home, = 0 otherwise
Parent at age 20	Dummy = 1 if respondent had children when they were 20 years of age or younger, = 0 otherwise
Partner employed	Dummy = 1 if the respondent's partner (spouse or de facto) is employed, = 0 otherwise
Partner self-employed	Dummy = 1 if the respondent's partner (spouse or de facto) is self-employed, = 0 otherwise
Permanent	Dummy = 1 if respondent works in a permanent position, = 0 if position is casual or temporary
Prefer fewer hours	Dummy = 1 if respondent would like to work fewer hours in their current or an alternative job, = 0 otherwise
Prefer more hours	Dummy = 1 if respondent would like to work more hours in their current or an alternative job, = 0 otherwise
Preschool-aged children	Dummy = 1 if respondent has children younger than 5 years of age living in household, = 0 otherwise
Promotion opportunities	Importance respondent places on having promotion opportunities at work, = 1 not important, = 2 somewhat important, = 3 important, = 4 very important
Public sector	Dummy = 1 if respondent works in the public sector, = 0 otherwise
Secondary (required)	Dummy = 1 if the respondent is required to have secondary schooling for their job, = 0 otherwise
Sense of satisfaction	Importance respondent places on having a sense of satisfaction with achievements at work, = 1 not important, = 2 somewhat important, = 3 important, = 4 very important
Small firm	Dummy = 1 if the firm employs less than 25 workers, = 0 otherwise
Supervisor/manager	Dummy = 1 if respondent has supervisory or managerial responsibilities in current workplace, = 0 otherwise
Tenure	Number of years respondent has worked for current employer

Appendix B: Participation results

Table 10: Employment participation equation, binary probit

	Combined		Male		Female	
Variable	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**	**Coeff.**	**Std. Err.**
Highest education						
Degree	0.803***	0.108	1.643***	0.321	0.656***	0.122
Diploma	0.131	0.121	0.197	0.274	0.155	0.135
Secondary	0.041	0.088	0.141	0.165	0.070	0.110
Individual characteristics						
Male	0.500***	0.073				
Age	0.055*	0.029	0.065	0.049	0.036	0.038
Age squared	- 0.001*	0.000	- 0.001	0.001	- 0.001	0.001
Marital status	0.049	0.090	0.336*	0.173	- 0.113	0.109
Number of children	- 0.078**	0.034	0.001	0.064	- 0.129***	0.042
Preschool-aged children	- 0.531***	0.098	0.187	0.220	- 0.780***	0.116
Immigrant from ESB	0.183	0.121	0.178	0.232	0.145	0.147
Immigrant from NESB	- 0.433***	0.117	- 0.407**	0.206	- 0.487***	0.153
Owner-occupier	0.134	0.091	0.213	0.165	0.096	0.115
Health status	- 0.241***	0.048	- 0.248***	0.082	- 0.238***	0.060
Other income	- 0.059***	0.010	- 0.088***	0.010	- 0.051***	0.013
Access to vehicle	0.652***	0.106	0.810***	0.184	0.507***	0.138
Constant	- 0.303	0.497	- 0.435	0.810	0.429	0.658
Number of observations	1862		769		1093	
Log likelihood	- 831.5		- 242.8		- 545.8	
Mean of dependent variable	0.743		0.832		0.681	

Levels of significance: *** p < 0.01, ** p < 0.05, * p < 0.10

Dependent variable: 1 = employed in the week prior to the interview; 0 = not employed in the week prior to the interview